Overview of the main forms of anticoagulant drugs

Health & Medicine

Anticoagulant drugs are basically purosed to minimize the capacity of the blood to clot. Such drugs exist in five (5) forms; Heparin, Oral anticoagulant, antiplatelete drugs, direct thrombin inhibitors and factor Xa inhibitor drugs.

Heparin

Originally, Heparin comes from animal tissues, and is essential for treatment and avoidance of formation. There are two types of heparin which include unfractioned heparin (UFH) and Low-molecular-weight heparin (LMWH) such as dalteparin, enoxaparin and tinzaparin. Generally, heparin drug is not absorbed easily from the GI tract. This makes it convenient to administer heparin through parenteral. Thus unfractioned heparin and Low-molecular-weight heparin are administered by subcutaneous. However, Low-molecular-weight heparin has to administered at daily basis due to its prolong circulation half-life, but it is not suitable for patients with renal function. Heparin metabolisation cocurs in the liver and and the by-products or metabolites are excreted in urine.

Once heparin is administered, it inhibits the production of thrombin as well as fibrin by activating antithrombin III. The antithrombin III then inactivates factors IXa, Xa, Xia and XIIa in the intrinsic and common pathway. Eventually, prevention of stable fibrin clot occur. When heparin is used in small amounts or doses, it increases the activity of antithrombin III against Xa and thrombin and inhibits clot formation. However, large doses are imperative in inhibing fibrin formation after a clot has been formed.

Use of heparin

Heparin has been found to be useful in many clinical conditions in preventing of new clot formation. One good example of such situation is the treatment of venous thromboemboli, which is associated excessive intravascular activation of blood clotting.

Factors affecting heparin absorption

The effectiveness of heparin is affected if the patient has taken non-inflammetory drugs, such as aspirin, clopidogrel, ticlopidime or dipyridamole, and lead to increased bleeding.

Oral anticoagulant

There could be a number of oral anticoagulant used in diferrent parts of the world. However, coumarin compound warfarin has been the major oral anticoagulant known in United States. Taking of warfarin orally speed up its absorption rate. Warfarin binds to plasma albumin which inturn broken down in the liver and removed from the body in urine. Warfarin takes 48 hours to seen the effects and outcome of the warfarin administration is presumably occur at 3 to 4 days.

Pharmacodynamics

Oral anticoagulants alter the ability of the liver to synthesize vitamin K–dependent clotting factors, including prothrombin and factors VII, IX, and X. However, clotting factors already in the bloodstream continue to coagulate blood until they become depleted, so anticoagulation doesn’t begin immediately.

Pharmacotherapeutics

Oral anticoagulants are used in the treatment or prevetion of thromboembolism.

Factors affecting its absorption

Taking highly protein-bound medications such as acetaminophen, allopurinol, amiodarone, cephalosporins, cimetidine, ciprofloxacin, clofibrate, danazol, diazoxide, disulfiram, erythromycin, fluoroquinolones, glucagon, heparin, ibuprofen, isoniazid, ketoprofen, increasethe effects of warfarin, resulting in an increased risk of bleeding.

Antiplatelete drugs

These are drugs that prevent arterial thromboembolism in patients that are vulnerable to stroke, MI and arteriosclerosis. This type of drugs include aspirin, clopidogrel, dipyridamole, sulfinpyrazone and ticlopidine. These drugs when taken are absorbed rapidly and attain maximum concentration within 1 to 2 hours. However, these drugs have varying periods of effectiveness, for example, aspirin maintain its effect in 10 days, clopidogrel lasts for 5 days while sulfinpyrazone needs several administration for its antiplatete effects to occur. Moreover, the drugs move rapidly throughout the body immediately after administration, and are accompanied with minimal break down and excreted in their usual form in urine. It takes only 15 to 20 minutes to observe the effects of these drugs.

Literature shows that these antiplatelete drugs obstruct platelete activity basing on the type of drug and their doses. For example, at low dose aspirin distract clotting activity by inhibiting synthesis of prostaglandin, thus prevent

formation thromboxane A. clopidogrel also works differently, and target to broke the activity of platelet fibrinogen. Similarly, ticlopidine inhibits the binding of fibrinogen to platelets during the initial stage of clotting cascade.

Factors affecting antiplatelet absorption

If antiplatelet drugs are taken with non-inflammetory drugs, heparin, oral anticoagulants or another antiplatelet drug, it increases risk of bleeding.

Direct thrombin inhibitors

These are drugs that are essential for preventing the formation of blood clots. Such drugs include argatroban, Bivalirudin and lipirudin.

These drugs are used in different clinical situations, for instance, argatroban and lepirudin are useful in the treatment of heparin-induced thrombocytopenia (HIT). Bivalirudin has been approved for use in patients with unstable angina undergoing PTCA, and should be used in conjunction with aspirin therapy. Patients with liver dysfunction may require a reduced dose of argatroban. Also, the dosage of bivalirudin and lepirudin may need to be reduced in patients with impaired renal function. Use caution when administering a direct thrombin inhibitor to a patient who has an increased risk of bleeding.

Circulation of direct thrombin inhibitors

These drugs are administered by I. V. infusion. They are also given as an intra-coronary bolus during cardiac catheterization. In such case, the drug begins acting in 2 minutes with maximum at 15 minutes and it lasts for 2 hours. The effects on PTT become evident within 4 to 5 hours of administration in peole with heparin-induced thrombocytopenia, and platelet

recovery occur within 3 days. The metabolism of argatrobin occur in the liver and is excreted in stool while Bivalirudin and lepirudin are broken down in the liver and kindeys whose excretes are discharged in urine.

Mechanism of direct thrombin inhibitors

Direct thrombin inhibitors obstruct the blood clotting by directly blocking all thrombin activity.

Factors Xa inhibitor drugs

These are drugs used to prevent DVT people undergoing total hip and knee replacement surgery or surgery to repair a hip fracture. The known example of factor Xa inhibitor is fondaparinux. This drug is useful in only preventing bloob clot formation.

How it circulates

This drug is rapidly absorbed and excreted unchanged in urine. The effects of factor Xa inhibitor drugs reache peak within 2 hours of administration and continues for 17 to 24 hours.

How it acts

Factor Xa inhibitor drug bind to antithrombin III and greatly influence neutralization of factor Xa by antithrombin III. The neutralization factor Xa interrupts the coagulation cascade, thereby inhibiting clot formation.